

## ABSTRACT

Provided is a method of manufacturing a semiconductor device capable of effectively removing impurity product attached to a semiconductor film while suppressing coming off of, for example, hemispherical grains formed on a semiconductor film containing an impurity. Spherical or hemispherical grains are formed on the surface of an amorphous silicon film containing phosphorus which forms a bottom electrode of a capacitor. In order to suppress depletion of the bottom electrode, annealing is performed in  $\text{PH}_3$  atmosphere so as to diffuse phosphorus to the grains. Cleaning is performed using hot water (deionized water) in order to remove the impurity product attached onto the surface of the bottom electrode by annealing. A native oxide film formed on the surface of the bottom electrode is removed by cleaning using a mixed solution of hydrofluoric acid and water. A dielectric film and a top electrode are formed in order so as to cover the surface of the bottom electrode. Thereby, a cylindrical capacitor is fabricated.